CLAIMS:

1. A method of forming a metal-containing film on a substrate, the method comprising:

providing a substrate in a process chamber of a batch type processing system;

heating the substrate;

flowing a pulse of a metal-containing precursor in the process chamber;

flowing a pulse of a reactant gas in the process chamber; and

repeating the flowing processes until a metal-containing film with desired film properties is formed on the substrate.

2. The method according to claim 1, wherein the repeating comprises forming a metal-oxide film.

3. The method according to claim 1, wherein the repeating comprises forming at least one of a HfO_2 film, a ZrO_2 film, and a film containing a mixture of HfO_2 and ZrO_2.

4. The method according to claim 1, further comprising flowing a purge gas in the process chamber.

5. The method according to claim 4, wherein the flowing a purge gas comprises flowing a flow rate between about 100sccm and about 10,000sccm.

6. The method according to claim 1, further comprising flowing a pulse of a purge gas in the process chamber when the metal-containing precursor and the reactant gas are not flowing.

7. The method according to claim 6, wherein the flowing a pulse of a purge gas comprises flowing a pulse duration between about 1sec to about 500sec.

8. The method according to claim 1, wherein the flowing a pulse of a metal-containing precursor comprises flowing a metal-containing precursor and a carrier gas.

9. The method according to claim 8, wherein the flowing a carrier gas comprises a flow rate between about 100sccm and about 10,000sccm.

10. The method according to claim 1, wherein the flowing a pulse of a reactant gas comprises flowing a reactant gas and a carrier gas.

11. The method according to claim 1, wherein the flowing a pulse of a reactant gas comprises flowing at least one of an oxidizing gas, a reducing gas, and an inert gas.

12. The method according to claim 11, wherein the flowing a pulse of an oxidizing gas comprises flowing an oxygen-containing gas.

13. The method according to claim 12, wherein the flowing a pulse of an oxygen-containing gas comprises flowing at least one of O_2, O_3, H_2O_2, H_2O, NO, N_2O, and NO_2.

14. The method according to claim 11, wherein the flowing a pulse of a reducing gas comprises flowing at least one of a hydrogen-containing gas, a silicon-containing gas, a boron-containing gas, and a nitrogen-containing gas.

15. The method according to claim 14, wherein the flowing a pulse of a hydrogen-containing gas comprises flowing H_2.

16. The method according to claim 14, wherein the flowing a pulse of a silicon-containing gas comprises flowing at least one of SiH_4, Si_2H_6, Si_2Cl_6, and $SiCl_2H_2$.

17. The method according to claim 14, wherein the flowing a pulse of a boron-containing gas comprises flowing a gas with the formula B_xH_{3x}.

18. The method according to claim 14, wherein the flowing a pulse of a the boron-containing gas comprises flowing at least one of BH_3, B_2H_6, and B_3H_9.

19. The method according to claim 14, wherein the flowing a pulse of a nitrogen-containing gas comprises flowing NH_3.

20. The method according to claim 1, wherein the providing comprises providing at least one of a semiconductor substrate, a LCD substrate, and a glass substrate.

21. The method according to claim 20, wherein the providing comprises providing a Si substrate or a compound semiconductor substrate.

22. The method according to claim 1, wherein the providing comprises providing a substrate containing an interfacial film selected from an oxide film, a nitride film, an oxynitride film, or mixtures thereof.

23. The method according to claim 1, wherein the providing comprises providing a batch of about 100 substrates or less.

24. The method according to claim 1, wherein the providing comprises providing a substrate with a substrate diameter greater than about 195 mm.

25. The method according to claim 1, wherein the flowing a pulse of a metal-containing precursor comprises flowing a pulse duration between about 1sec and about 500sec.

26. The method according to claim 1, wherein the flowing a pulse of a reactant gas comprises flowing a pulse duration between about 1sec and about 500sec.

27. The method according to claim 1, wherein the heating comprises heating the substrate to between about 100°C and about 600°C.

28. The method according to claim 1, wherein the heating comprises heating the substrate to below about 200°C.

29. The method according to claim 1, wherein the flowing a pulse of a metal-containing precursor further comprises flowing a metal-containing precursor liquid into a vaporizer at a flow rate between about 0.05ccm and about 1ccm.

30. The method according to claim 1, wherein the flowing a pulse of a reactant gas comprises flowing a flow rate between about 100sccm and about 2,000sccm.

31. The method according to claim 1, further comprising providing a process chamber pressure less than about 10Torr.

32. The method according to claim 1, further comprising providing a process chamber pressure between about 0.05Torr and about 2Torr.

33. The method according to claim 1, further comprising providing a process chamber pressure of about 0.3Torr.

34. The method according to claim 1, wherein the repeating comprises forming a metal-containing film with a film thickness less than about 1000A.

35. The method according to claim 1, wherein the repeating comprises forming a metal-containing film with a film thickness less than about 200A.

36. The method according to claim 1, wherein the repeating comprises forming a metal-containing film with a film thickness less than about 50A.

37. The method according to claim 1, further comprising annealing the metal-containing film at a temperature between about 150°C and about 1000°C.

38. The method according to claim 1, further comprising depositing an electrode film comprising at least one of W, Al, TaN, TaSiN, HfN, HfSiN, TiN, TiSiN, Re, Ru, Si, poly-Si, and SiGe.

39. The method according to claim 1, further comprising flowing a pulse of a nitrogen-containing gas in the process chamber.

40. The method according to claim 39, wherein the repeating comprises forming a metal-oxynitride film.

41. The method according to claim 39, wherein the repeating comprises forming at least one of a $Hf_xO_zN_w$ film, a $Zr_xO_zN_w$ film, and a film containing a mixture of $Hf_xO_zN_w$ and $Zr_xO_zN_w$.

42. The method according to claim 39, wherein:

the flowing a pulse of a metal-containing precursor comprises flowing at least one pulse,

the flowing a pulse of a reactant gas comprises flowing at least one pulse, and

the flowing a pulse of a nitrogen-containing gas comprises at least one pulse.

43. The method according to claim 1, further comprising flowing a pulse of a silicon-containing gas in the process chamber.

44. The method according to claim 43, wherein the repeating comprises forming a metal-silicate film.

45. The method according to claim 43, wherein the repeating comprises forming at least one of a $Hf_xSi_yO_z$ film, a $Zr_xSi_yO_z$ film, and a film containing a mixture of $Hf_xSi_yO_z$ and $Zr_xSi_yO_z$.

46. The method according to claim 43, wherein:

the flowing a pulse of a metal-containing precursor comprises flowing at least one pulse,

the flowing a pulse of a reactant gas comprises flowing at least one pulse, and

the flowing a pulse of a silicon-containing gas comprises at least one pulse.

47. The method according to claim 43, further comprising flowing a pulse of nitrogen-containing gas in the process chamber

48. The method according to claim 47, wherein the repeating comprises forming a nitrogen-containing metal-silicate film.

49. The method according to claim 47, wherein the repeating comprises forming at least one of a $Hf_xSi_yO_zN_w$ film, a $Zr_xSi_yO_zN_w$ film, and a film containing a mixture of $Hf_xSi_yO_zN_w$ and $Zr_xSi_yO_zN_w$.

50. The method according to claim 47, wherein:

the flowing a pulse of a metal-containing precursor comprises flowing at least one pulse,

the flowing a pulse of a reactant gas comprises flowing at least one pulse,

the flowing a pulse of a nitrogen-containing gas comprises at least one pulse, and

the flowing a pulse of a silicon-containing gas comprises at least one pulse.

51. The method according to claim 1, wherein the repeating comprises forming a metal-containing film in a self-limiting process.

52. The method according to claim 1, wherein the heating comprises heating the substrate under isothermal heating conditions.

53. The method according to claim 1, wherein the flowing a pulse of a metal-containing precursor comprises flowing a metal alkoxide.

54. The method according to claim 53, wherein the flowing a metal alkoxide comprises flowing at least one of $M(OMe)_4$, $M(OEt)_4$, $M(OPr)_4$, and $M(OBu^t)_4$.

55. The method according to claim 53, wherein the flowing a metal alkoxide comprises flowing at least one of a hafnium alkoxide and a zirconium alkoxide.

56. The method according to claim 53, wherein the flowing a metal alkoxide comprises flowing at least one of $Hf(OBu^t)_4$ and $Zr(OBu^t)_4$.

57. The method according to claim 53, wherein the flowing a metal alkoxide comprises flowing at least one of $M(OR)_2(mmp)_2$ and $M(mmp)_4$.

58. The method according to claim 1, wherein the flowing a pulse of a metal-containing precursor comprises flowing a metal alkylamide.

59. The method according to claim 58, wherein the flowing a metal alkylamide comprises flowing at least one of a hafnium alkylamide and a zirconium alkylamide.

60. The method according to claim 58, wherein the flowing a metal alkylamide comprises at least one of $Hf(NEt_2)_4$, $Hf(NEtMe)_4$, $Zr(NEt_2)_4$, and $Zr(NEtMe)_4$.

61. The method according to claim 1, wherein:

the providing comprises providing a plurality of substrates in said process chamber, and

the repeating comprises forming an HfO_2 film on each of the plurality of substrates, the plurality of substrates having a thickness of about 30A to about 50A and a WIW uniformity of about 10% to about 15%.

62. The method according to claim 1, wherein:

the providing comprises providing a plurality of substrates in said process chamber, and

the repeating comprises forming an HfO_2 film on each of the plurality of substrates, the plurality of substrates having a thickness of about 20A to about 50A and a WIW uniformity of about 20% or less.

63. The method according to claim 1, wherein:

the providing comprises providing a plurality of substrates in said process chamber,

the repeating comprises forming an HfO_2 film on each of the plurality of substrates, and

the heating comprises heating within a temperature range at which film deposition rate is independent of temperature.

64. The method according to claim 63, wherein said heating comprises heating within a temperature range of about 160 to 180°C.

65. A computer readable medium containing program instructions for execution on a processor, which when executed by the processor, cause a batch substrate processing apparatus to perform the steps in the method recited in claim 1.

66. A system for batch processing a plurality of substrates, comprising:

means for providing a substrate in a process chamber of a batch type processing system;

means for heating the substrate;

means for flowing a pulse of a metal-containing precursor in the process chamber;

means for flowing a pulse of a reactant gas in the process chamber; and

repeating the flowing processes until a metal-containing film with desired film properties is formed on the substrate.

67. A processing tool, comprising:

a batch type processing system configured to form a metal-containing film;

a transfer system configured to provide a substrate in a process chamber of the batch type processing system;

a heater for heating the substrate;

a gas injection system configured to flow a pulse of a metal-containing precursor gas in the process chamber, flow a pulse of a

reactant gas in the process chamber, and repeat the flowing processes until a metal-containing film with desired film properties is formed on the substrate; and

a controller configured to control the processing tool.

68. The processing tool according to claim 67, further comprising a processing system configured to form an interfacial film on the substrate.

69. The processing tool according to claim 67, further comprising a processing system configured to anneal a film on the substrate.

70. The processing tool according to claim 67, further comprising a processing system configured to perform a preclean process on the substrate.

71. The processing tool according to claim 67, wherein the batch type processing system comprises at least one process tube.

72. The processing tool according to claim 67, further comprising a process monitoring system.

73. The processing tool according to claim 67, wherein the gas injection system is further configured to flow at least one of a carrier gas and a purge gas.

74. The processing tool according to claim 67, wherein the tool is configured to form a metal-containing film comprises at least one of metal-oxide film, a metal-oxynitride film, a metal-silicate film, and a nitrogen-containing metal-silicate film.

75. The method according to claim 67, wherein the gas injection system is configured to flow a metal-containing precursor comprising at least one of an alkoxide and an alkylamide.

76. The method according to claim 67, wherein the gas injection system is configured to flow a metal-containing precursor comprising at least one of hafnium and zirconium.

77. The processing tool according to claim 67, wherein the gas injection system is further configured to flow at least one of a pulse of a nitrogen-containing gas and a pulse of a silicon-containing gas.